
Space Weather Forecast

Issued on Wednesday 1 January 2025 at 01:24 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

Space Weather Forecast Headline: Minor/Moderate radio blackouts expected with a slight chance of Strong blackouts. A coronal mass ejection (CME) arrival is expected on 1st Jan, with Minor/Moderate storm likely, with a slight chance of Strong storm.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate with three Moderate class flares during the past 24 hours, the peak flare originating from a relatively small and moderately complex region in the northwest. The most magnetically complex region on the disc, located in the northwest and approaching the limb, produced the majority of the flare activity, including a long duration M-class flare.

There are currently nine sunspot regions on the visible disc, of which eight are numbered. The region in the northwest that produced the peak flare is the largest and most active region but has been relatively stable in terms of growth over the last 24 hours, possibly declining a little. Further complex groups lie in the southeast and the central northern hemisphere. The remaining regions are all relatively simple or only slowly evolving.

No Earth directed Coronal Mass Ejections (CME's) were observed in available imagery.

Solar Wind / Geomagnetic Activity: A CME arrived at Earth at 31/1626 UTC, which is attributed to a CME which left the Sun on the 29th. Before the CME arrival solar winds showed a slow regime, with a weak to moderate magnetic field strength and the north-south component of the magnetic field has also varying generally weakly. Geomagnetic activity was Quiet.

After the CME arrival solar winds increased to slightly elevated levels, peaking at 489 km/s at 31/1716 UTC. The magnetic field strength quickly increased to strong levels, but then declined to moderate levels by the end of the day. The north-south component temporarily became strongly negative, then gradually became only weakly negative by the end of the period. Geomagnetic activity increased to Active (Kp 4) levels.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) at GOES18 remained at background levels throughout, well below the 1-pfu S1/Minor Radiation Storm threshold.

Four-Day Space Weather Forecast Summary

Solar Activity: Generally Moderate solar activity is expected with isolated Moderate-class flares, and a slight but declining chance of isolated Strong-class flares, mainly from the region in the northwest which will rotate onto the far side through the forecast period.

Solar Wind / Geomagnetic Activity: No coronal hole fast winds currently feature in the forecast. A partial halo CME was observed from AR3939 late on the 29 Dec, with the potential to reach Earth on Day 1 (01 Jan), however little material is expected with this second CME and so impacts are expected to be limited, most likely to prolonged slightly enhanced geomagnetic activity from the CME arrival on the 31st.

Geomagnetic activity is expected to be predominantly Unsettled to Active today (01 Jan) but with isolated Minor/Moderate storm intervals likely. The CME effects will gradually wane through days Day 2 and 3 (02 and 03 Jan), back towards Quiet to Unsettled conditions.

Energetic Particles / Solar Radiation: There is a chance of S1/Minor Radiation Storm enhancements during the period, should any significant flares occur from regions in the western hemisphere.

Geomagnetic Storms

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	60	30	10	5
Strong	G3	No	5	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	70	50	40	40
Very Active	R3-R5 (X Class)	No	15	5	1	1

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level (cm ⁻² sr ⁻¹ s ⁻¹)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	20	20	20	20
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = cm ⁻² sr ⁻¹ s ⁻¹)						